



Project Introduction

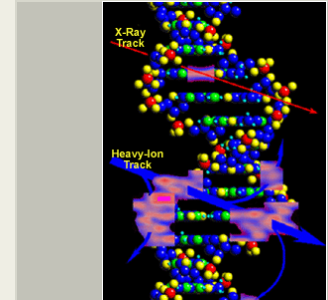
The overarching objective of the RadWorks project is to mature and demonstrate affordable, enabling solutions that mitigate radiation-related challenges of human exploration beyond Earth's orbit.

RadWorks technology is categorized as a hardware system for other applications. Since its inception in FY12, the RadWorks project has had as its overarching objective to mature and demonstrate affordable, enabling solutions to mitigate the radiation-related challenges of human space exploration. This has been done through the maturation and demonstration of system-level monitoring and design solutions. Since FY12, the project has continued to develop and deliver affordable, prototype and flight caliber element-integrated monitoring and alert/warning subsystems capable of enabling both ground-supported and autonomous architectural operations. In addition, the project has been doing comparative assessments of data collected utilizing radiation modeling programs, as well as producing advancements of modeling capability to enable protection and operational efficiencies for radiation shielding.

Every year the portfolio of technology work can change. In FY19, the RadWorks project is continuing its maturation and flight certification of advanced, miniaturized radiation measurement technologies, along with their demonstrations. The RadWorks project successfully flew the Battery Operated Independent Radiation Detector (BIRD), a simplified, non-integrated version of Radiation Environment Monitor (REM) aboard the Multi-Purpose Crew Vehicle (MPCV) Exploration Flight Test-1 (EFT-1) to validate system operation in a space radiation environment and record charged particle data for post-flight analysis. In addition, there are ten REM sensors flying on the International Space Station (ISS). These sensors are plugged into laptops and are measuring the ionizing radiation environment at different locations in the vehicle. Seven of these sensors transitioned to Flight Operations in June of 2019.

The Miniaturized Particle Telescope (MPT), a stacked version of the REM sensor is also flying on the ISS as a test instrument to investigate alternate configurations of the TimePix technology. The Hybrid Electronic Radiation Assessor (HERA), which is slated to fly as a Flight Test Objective (FTO) on the MPCV Experimental Module-1 (EM-1) flight, has been successfully integrated into the capsule awaiting flight in 2020. The flight spare for this launch is currently on ISS and successfully collected data for a 30-day end-to-end test that began in March 2019.

The next generation of the HERA is slated to fly on the MPCV EM-2 flight, as an integrated part of the Caution & Warning System (CWS). A payload, the Fast Neutron Spectrometer (FNS), developed by Marshall Space Flight Center (MSFC) is currently flying and collecting data on the ISS. Modeling work conducted by the project, which is being utilized by multiple vehicle



RadWorks Project

Table of Contents

Project Introduction	1
Anticipated Benefits	2
Primary U.S. Work Locations and Key Partners	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3
Images	5
Stories	5

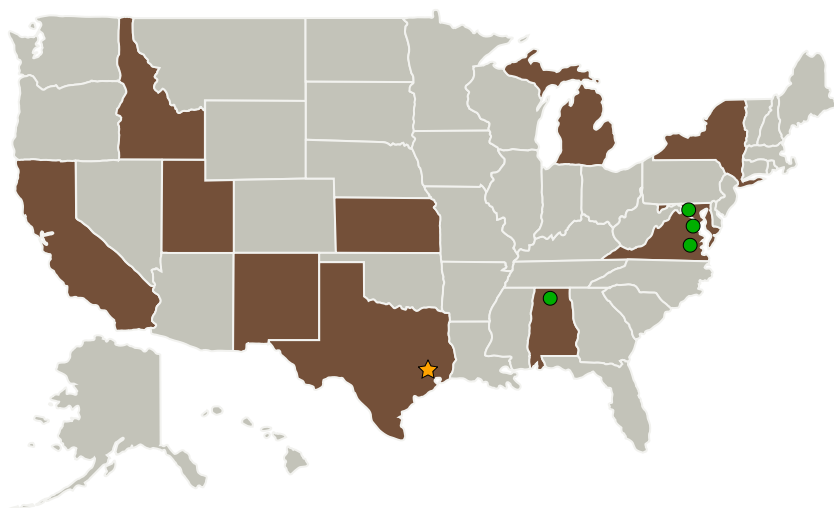


developers, includes updates to modeling capabilities for determining sheltering needs in vehicle designs, as well as assisting with vehicle layouts to maximize crew protection capabilities. Shielding concepts are being assessed to enhance safe days in space.

Anticipated Benefits

The technologies can protect crew health through compact, low mass, low power radiation monitoring/alert and mitigation using strategic arrangement of vehicle assets.

Primary U.S. Work Locations and Key Partners



Organizational Responsibility

Responsible Mission Directorate:

Exploration Systems Development Mission Directorate (ESDMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Exploration Capabilities

Project Management

Program Director:

Christopher L Moore

Project Manager:

Catherine D Mcleod

Principal Investigator:

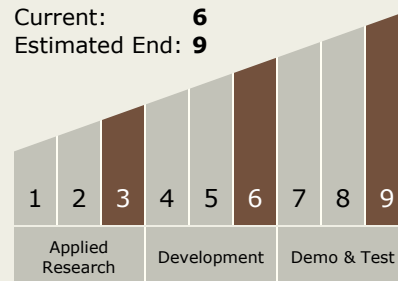
Edward J Semones

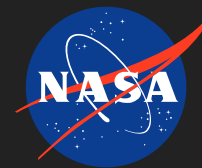
Technology Maturity (TRL)

Start: 3

Current: 6

Estimated End: 9





Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Analytical Mechanics Associates, Inc.	Supporting Organization	Industry	Hampton, Virginia
Brookhaven National Laboratory(BNL)	Supporting Organization	R&D Center	Upton, New York
Futron	Supporting Organization	Industry Small Disadvantaged Business (SDB)	
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland
Idaho National Laboratory(INL)	Supporting Organization	R&D Center	Idaho Falls, Idaho
Jacobs Engineering Group, Inc.	Supporting Organization	Industry	Dallas, Texas
Kansas State University	Supporting Organization	Academia	Manhattan, Kansas
KBRwyle, Inc.	Supporting Organization	Industry	Houston, Texas
L-3 Communications Electron Technology, Inc.	Supporting Organization	Industry	
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Continued on following page.

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.5 Radiation
 - └ TX06.5.5 Monitoring Technology

Target Destinations

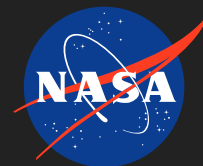
Earth, The Moon, Mars

RadWorks Project

Completed Technology Project (2011 - 2022)



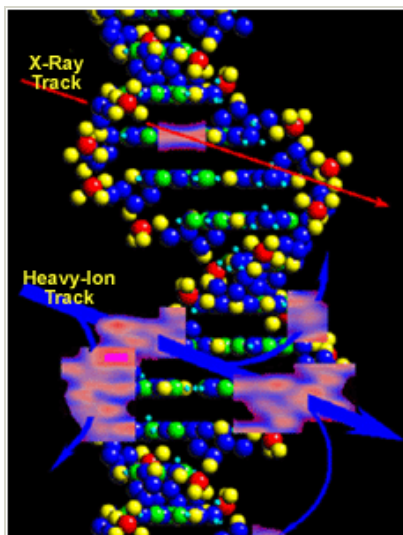
Organizations Performing Work	Role	Type	Location
Los Alamos National Laboratory(LANL)	Supporting Organization	R&D Center	Los Alamos, New Mexico
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama
MRI Technologies	Supporting Organization	Industry Women-Owned Small Business (WOSB)	
● NASA Headquarters(HQ)	Supporting Organization	NASA Center	Washington, District of Columbia
Space Technology Corporation	Supporting Organization	Industry	
Universities Space Research Association Division of Life Sciences(USRA-DSLS)	Supporting Organization	Academia	Huntsville, Alabama
University of Alabama in Huntsville(UAH)	Supporting Organization	Academia	Huntsville, Alabama
University of Hawaii Maui College	Supporting Organization	Academia Alaska Native and Native Hawaiian Serving Institutions (ANNH), Asian American Native American Pacific Islander (AANAPISI)	Kahului, Hawaii
University of Houston	Supporting Organization	Academia Asian American Native American Pacific Islander (AANAPISI), Hispanic Serving Institutions (HSI)	Houston, Texas
University of Michigan-Ann Arbor	Supporting Organization	Academia	Ann Arbor, Michigan
University of Utah	Supporting Organization	Academia	Salt Lake City, Utah



Primary U.S. Work Locations

Alabama	California
District of Columbia	Idaho
Kansas	Maryland
Michigan	New Mexico
New York	Texas
Utah	Virginia

Images



RadWorks Project

RadWorks Project

(<https://techport.nasa.gov/image/100938>)

Stories

EFT-1 RadWorks BIRD Success Story

(<https://techport.nasa.gov/file/124630>)



EFT-1 RadWorks Bird Technology Infusion
(<https://techport.nasa.gov/file/124631>)